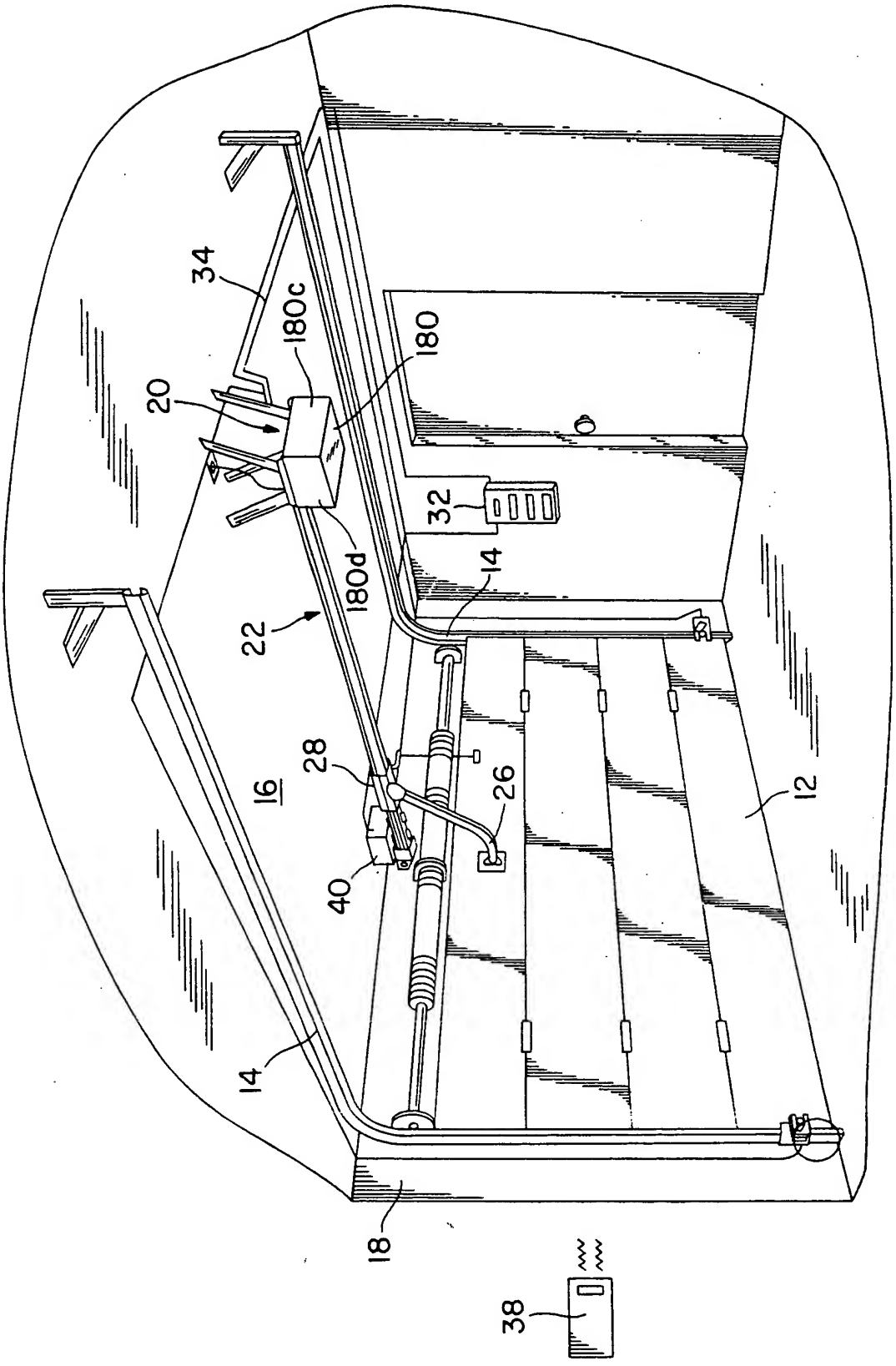


FIG. 1

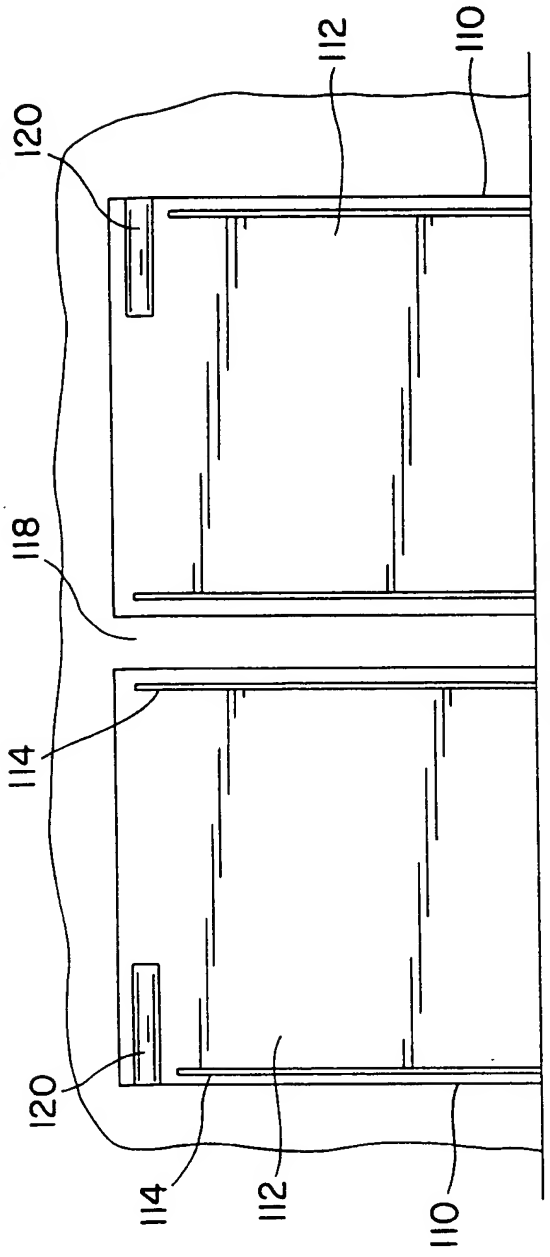

120
112
110
118
114
120
114
112
110

FIG. 2

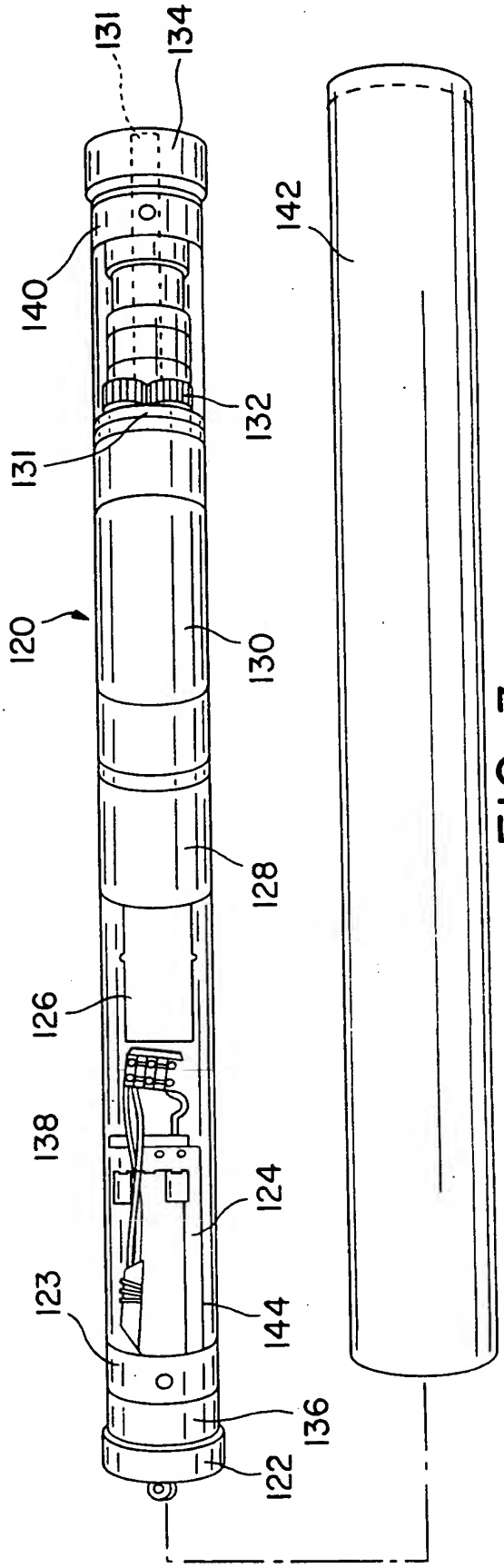

131
134
142
140
132
131
120
130
128
126
138
124
123
144
136
122

FIG. 3

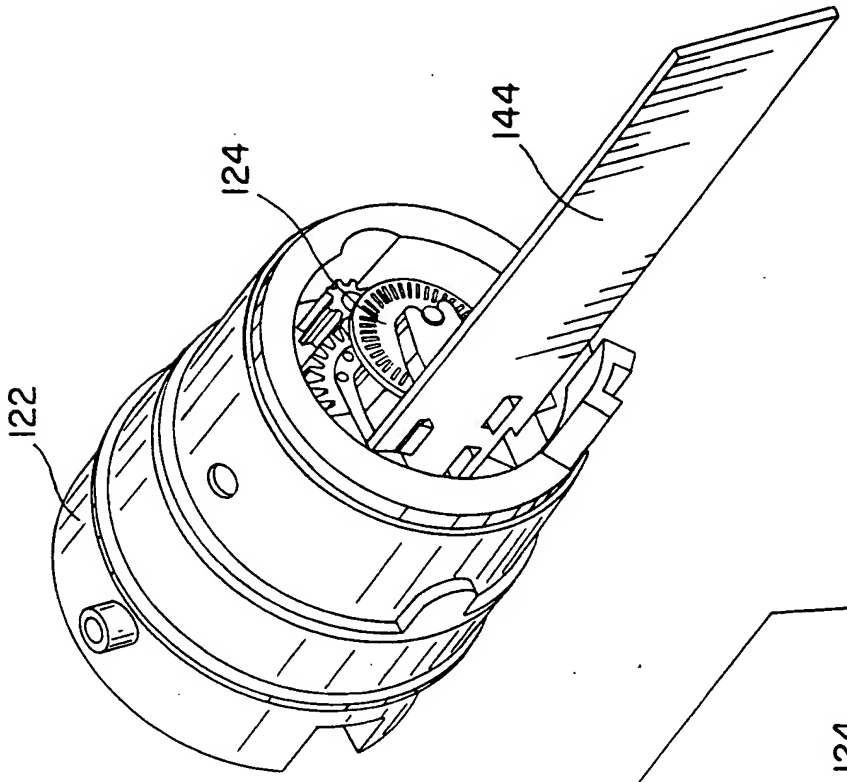


FIG. 5

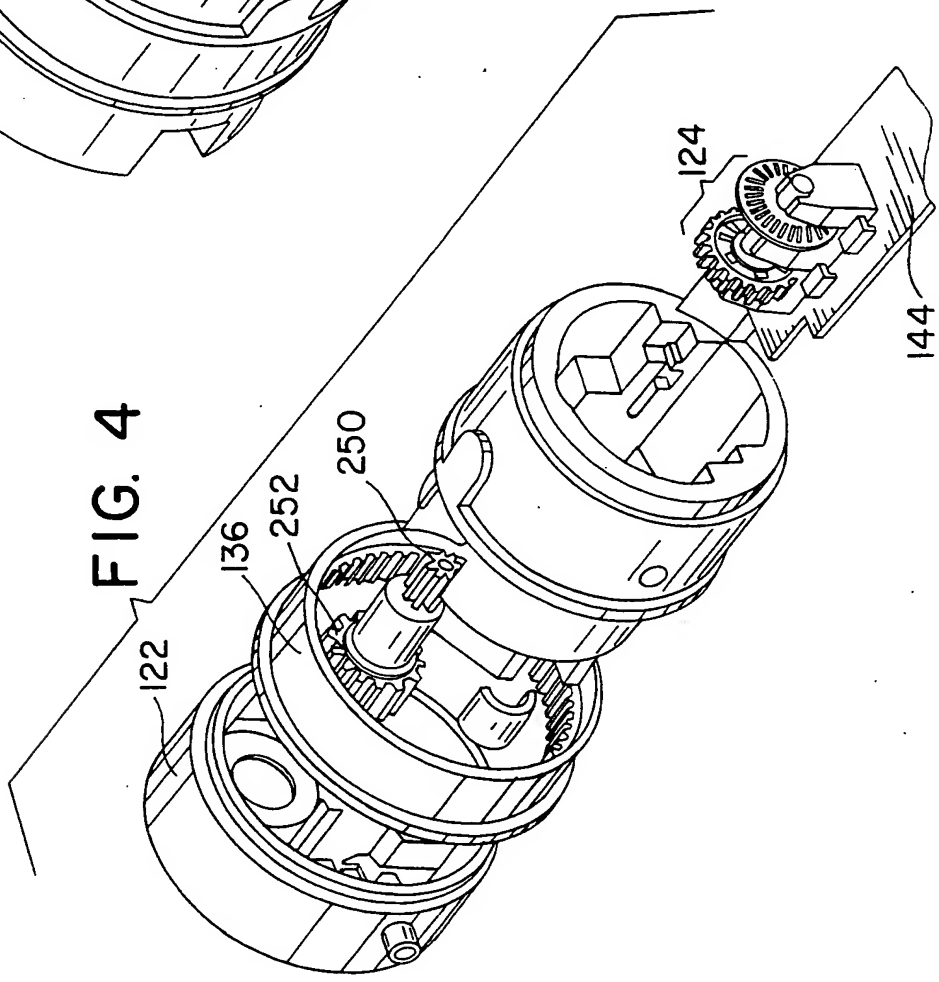


FIG. 4

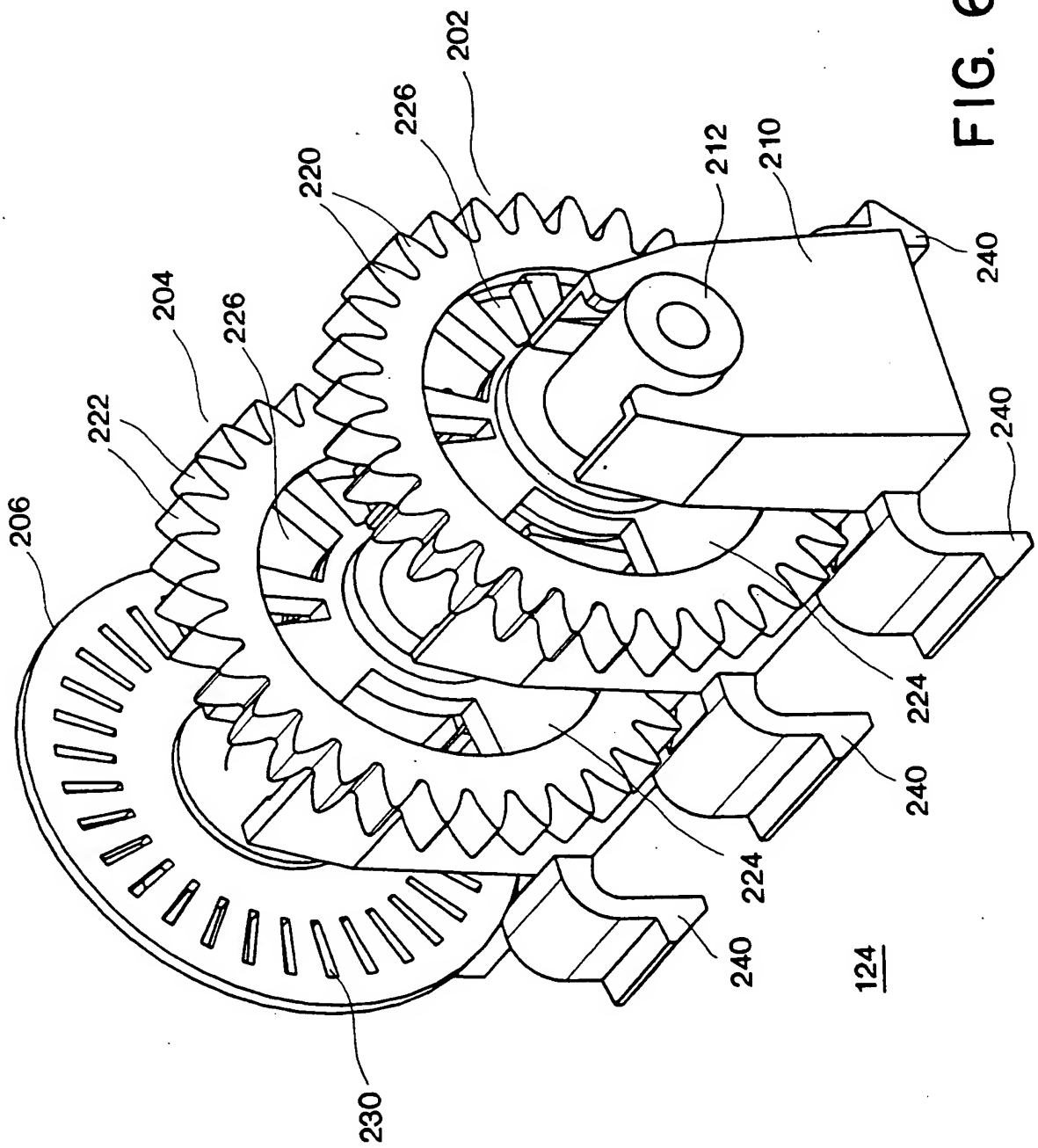
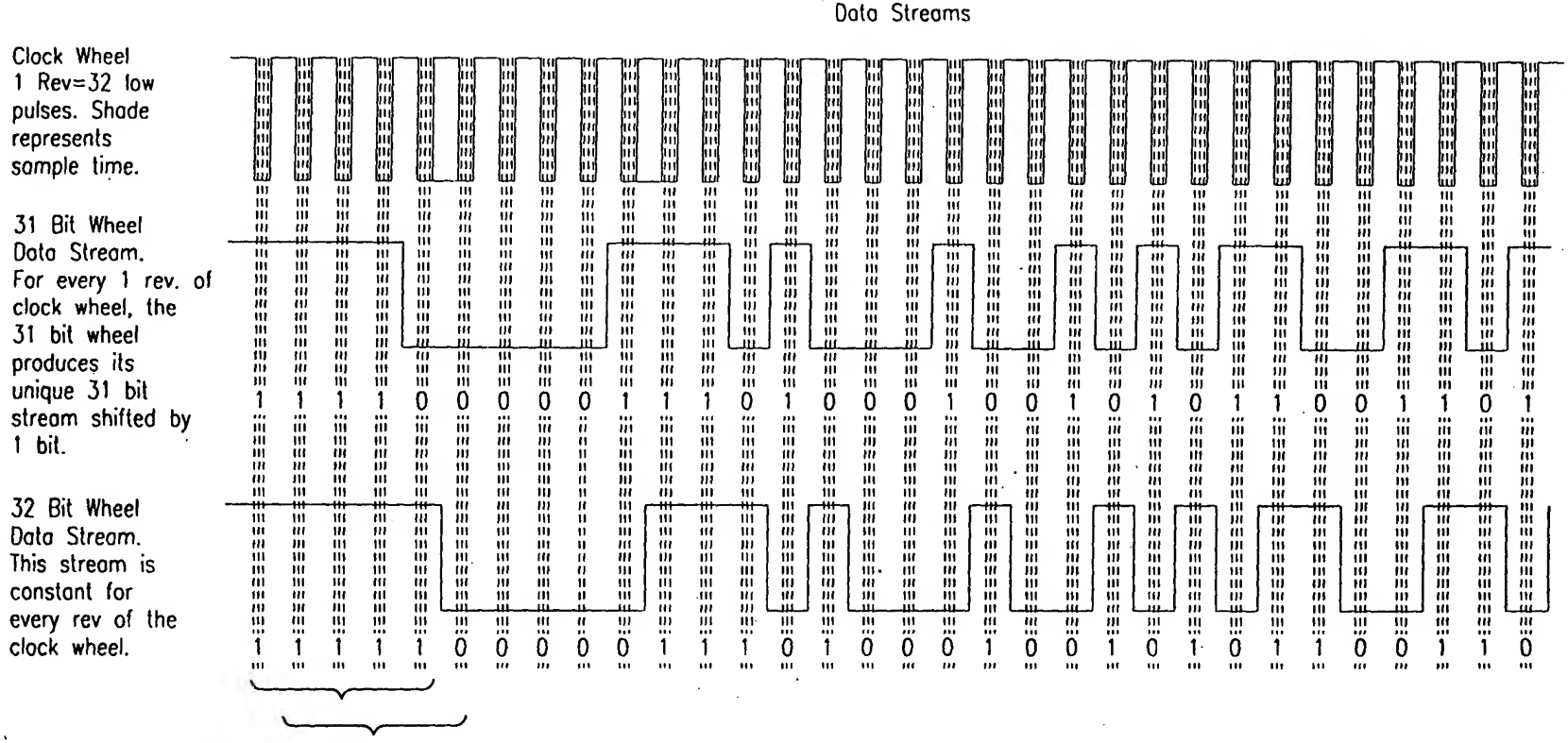

202
226
220
212
210
240
204
226
222
240
206
224
240
224
240
230
124

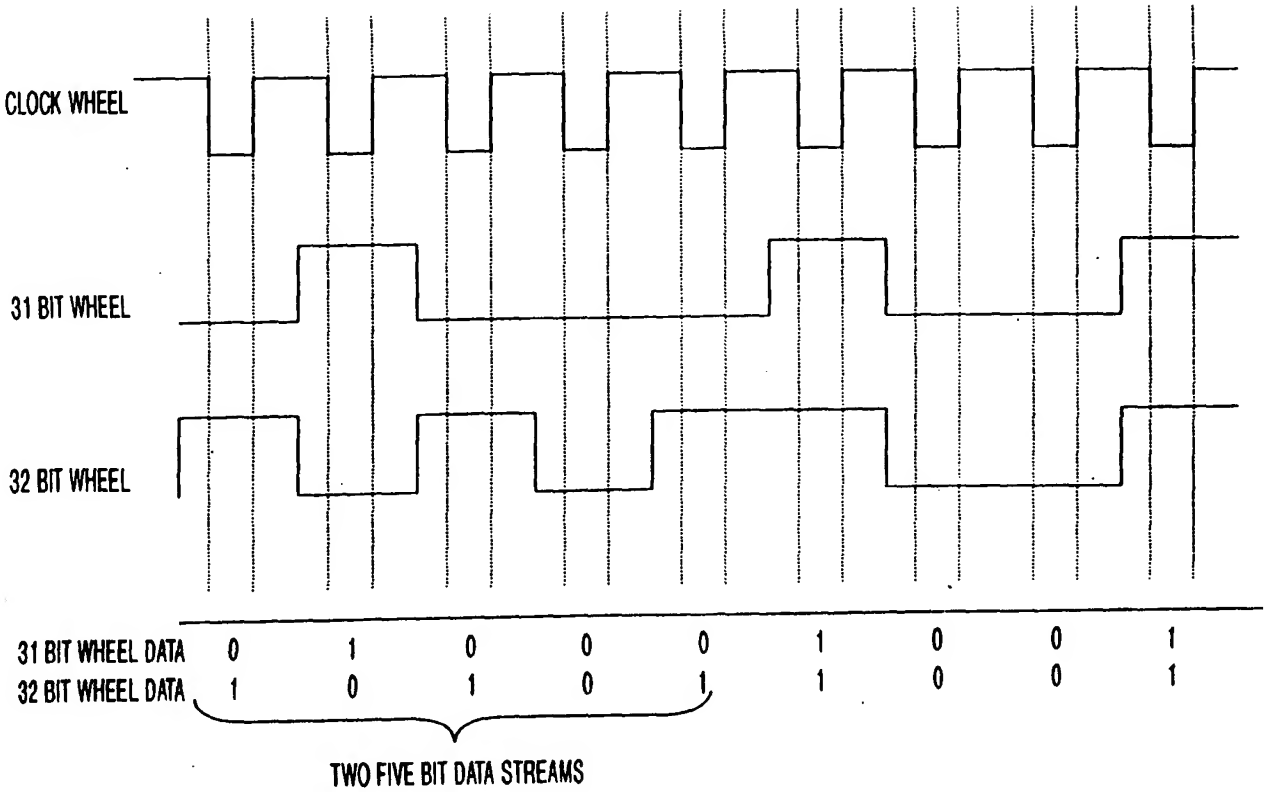
FIG. 6

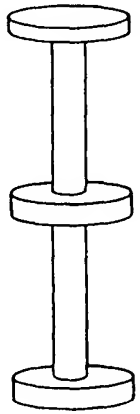


In the 32 bit stream, no five consecutive bits are repeated any where else in the stream. This is also true for the 31 data bit stream. Five consecutive bits are sampled from each wheel. The decimal value is calculated for each 5 bit binary number. The attached look-up table is used to convert each decimal number. Then a mathematical operation is performed on the two converted numbers to produce an absolute position. See the attached example and look up table.

FIG. 7

EXAMPLE





CLOCK WHEEL.
TIED TO THE AXLE AND THE 32 BIT WHEEL. 1 TURN OF 32 BIT WHEEL=1 TURN OF THIS WHEEL.

31 BIT DATA WHEEL.
HAS 31 TEETH. FREE SPINNING WHEEL. ONE TURN OF 32 BIT WHEEL=32/31 TURNS OF THIS WHEEL.

32 BIT DATA WHEEL.
HAS 32 TEETH. TIED TO THE AXLE AND THE CLOCK WHEEL. ONE TURN OF CLOCK WHEEL=1 TURN OF THIS WHEEL.

DATA STREAMS	DECIMAL CONV.	LOOK-UP CONV.	LOOK-UP 1-LOOK UP 2	IF NEGATIVE ADD 31	(RESULT *32)+LOOK-UP 2=ABSOLUTE POSITION
010000	08	12	12-20=-8	-8+31=23	(23*32)+20=756
10101	21	20			

FIG. 8

Smith et al.
METHOD AND APPARATUS ... BARRIER
Serial No. 10/137,580
Docket No. 73896/5569
Sheet 6 of 11
Kenneth H. Samples
(312) 577-7000

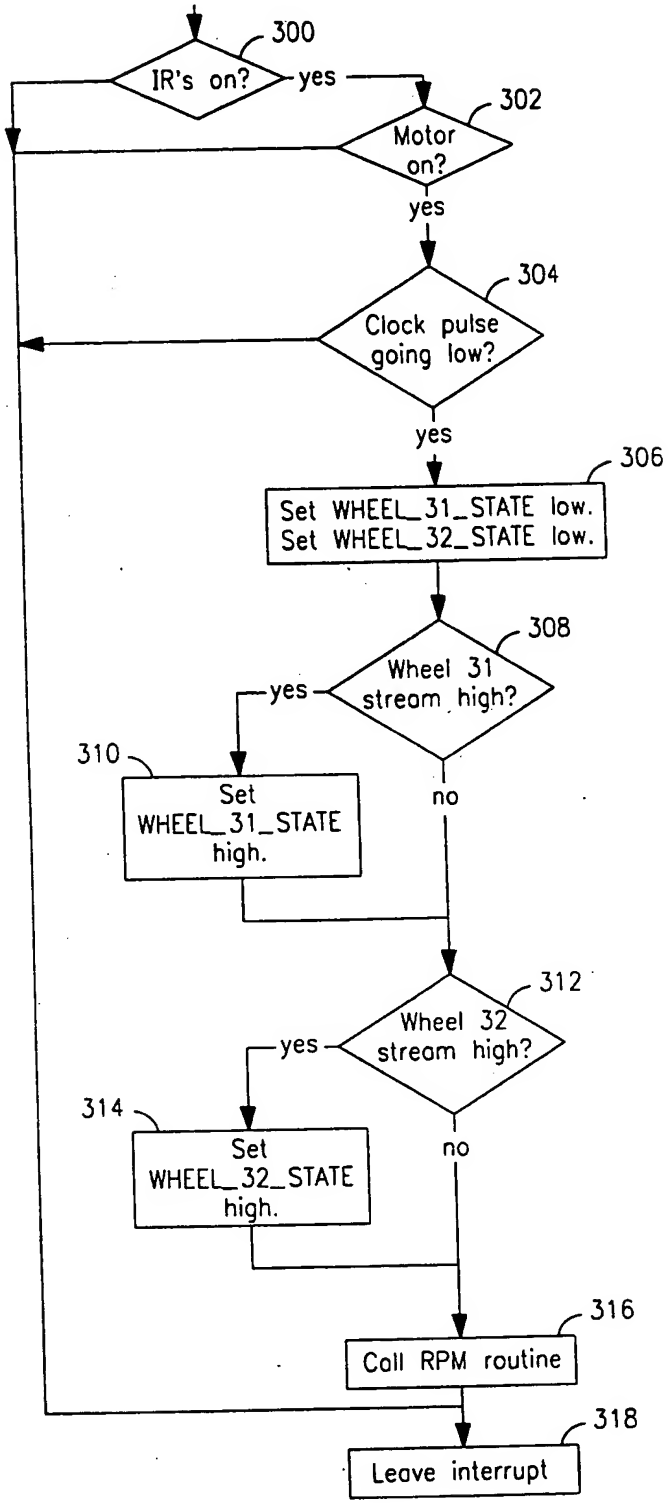

300
IR's on?
yes
302
Motor on?
yes
304
Clock pulse going low?
yes
306
Set WHEEL_31_STATE low.
Set WHEEL_32_STATE low.
308
Wheel 31 stream high?
yes
no
310
Set WHEEL_31_STATE high.
312
Wheel 32 stream high?
yes
no
314
Set WHEEL_32_STATE high.
316
Call RPM routine
318
Leave interrupt

FIG. 9

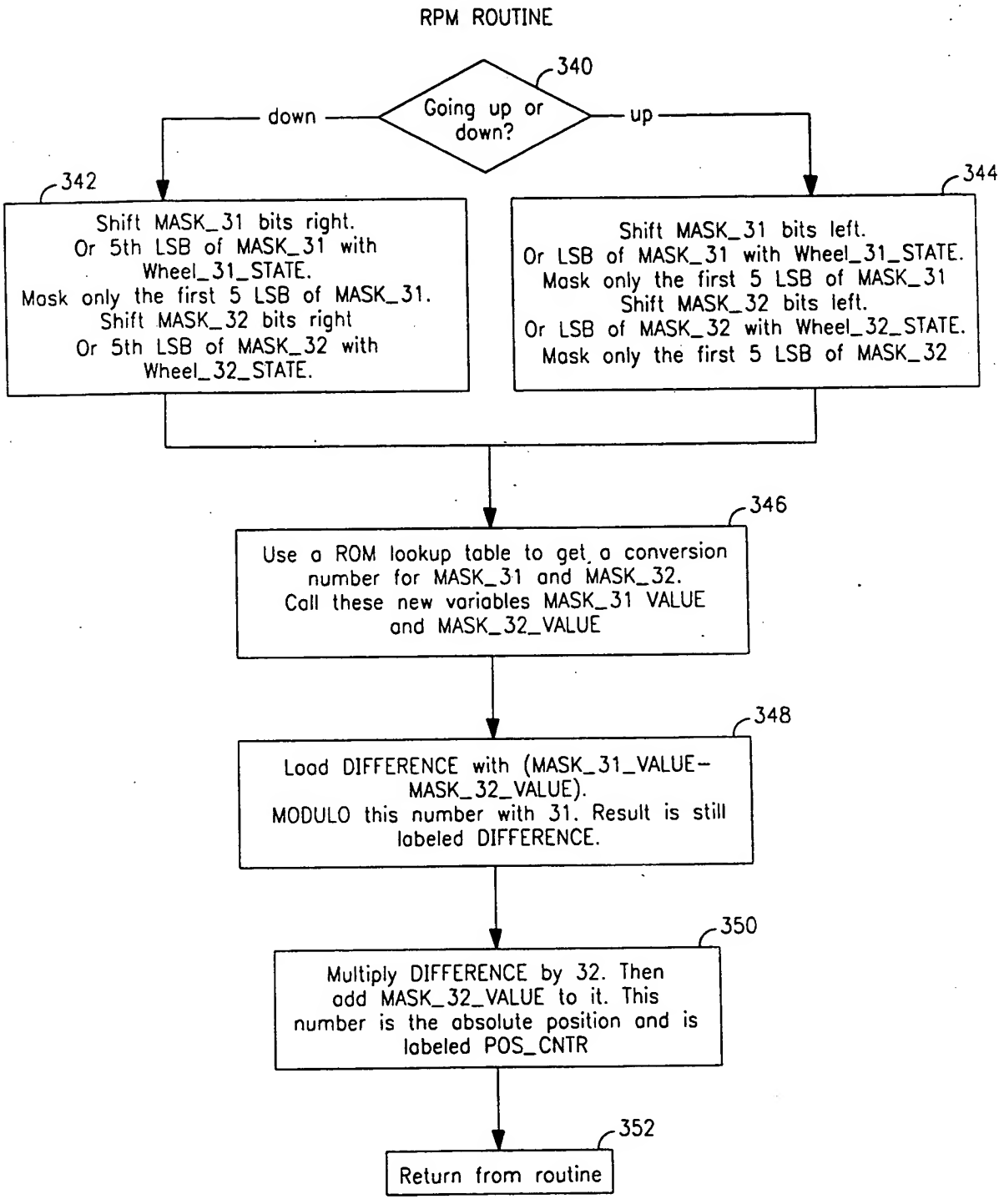

RPM ROUTINE
340
Going up or down?
down
up
342
Shift MASK_31 bits right.
Or 5th LSB of MASK_31 with Wheel_31_STATE.
Mask only the first 5 LSB of MASK_31.
Shift MASK_32 bits right
Or 5th LSB of MASK_32 with Wheel_32_STATE.
344
Shift MASK_31 bits left.
Or LSB of MASK_31 with Wheel_31_STATE.
Mask only the first 5 LSB of MASK_31
Shift MASK_32 bits left.
Or LSB of MASK_32 with Wheel_32_STATE.
Mask only the first 5 LSB of MASK_32
346
Use a ROM lookup table to get a conversion number for MASK_31 and MASK_32.
Call these new variables MASK_31 VALUE and MASK_32_VALUE
348
Load DIFFERENCE with (MASK_31_VALUE-MASK_32_VALUE).
MODULO this number with 31. Result is still labeled DIFFERENCE.
350
Multiply DIFFERENCE by 32. Then add MASK_32_VALUE to it. This number is the absolute position and is labeled POS_CNTR
352
Return from routine

FIG. 10

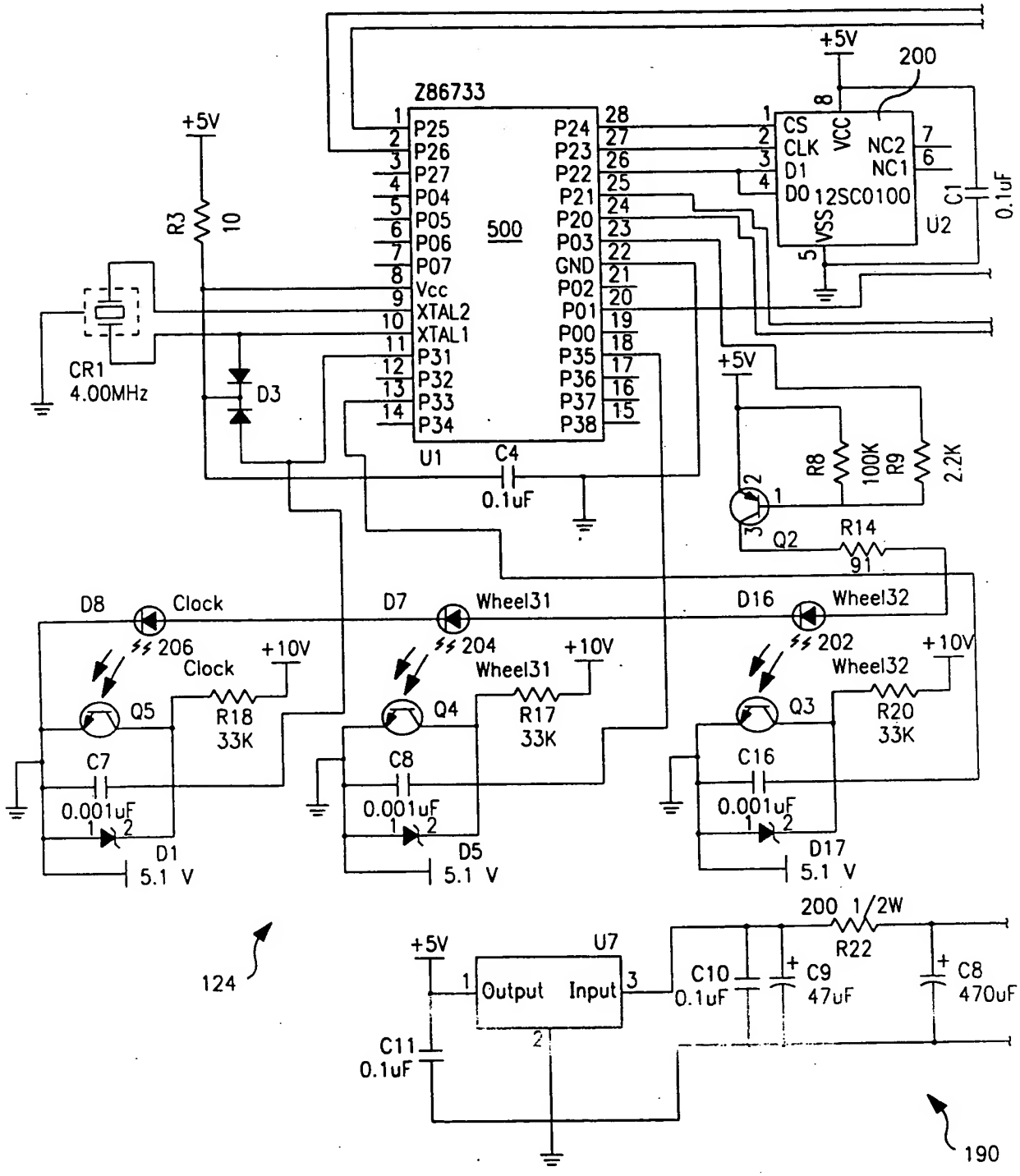

Z86733
500
U1
P25
P26
P27
P04
P05
P06
P07
Vcc
XTAL2
XTAL1
P31
P32
P33
P34
P24
P23
P22
P21
P20
P03
GND
P02
P01
P00
P35
P36
P37
P38
+5V
R3
10
CR1
4.00MHz
D3
C4
0.1uF
200
CS
CLK
D1
DO
VCC
VSS
NC2
NC1
12SC0100
U2
C1
0.1uF
R8
100K
R9
2.2K
Q2
R14
91
D8
Clock
206
Q5
R18
33K
C7
0.001uF
D1
5.1 V
D7
Wheel31
204
Q4
R17
33K
C8
0.001uF
D5
5.1 V
D16
Wheel32
202
Q3
R20
33K
C16
0.001uF
D17
5.1 V
+10V
124
U7
Output
Input
C11
0.1uF
C10
0.1uF
C9
47uF
C8
470uF
200 1/2W
R22
190

FIG. 11A

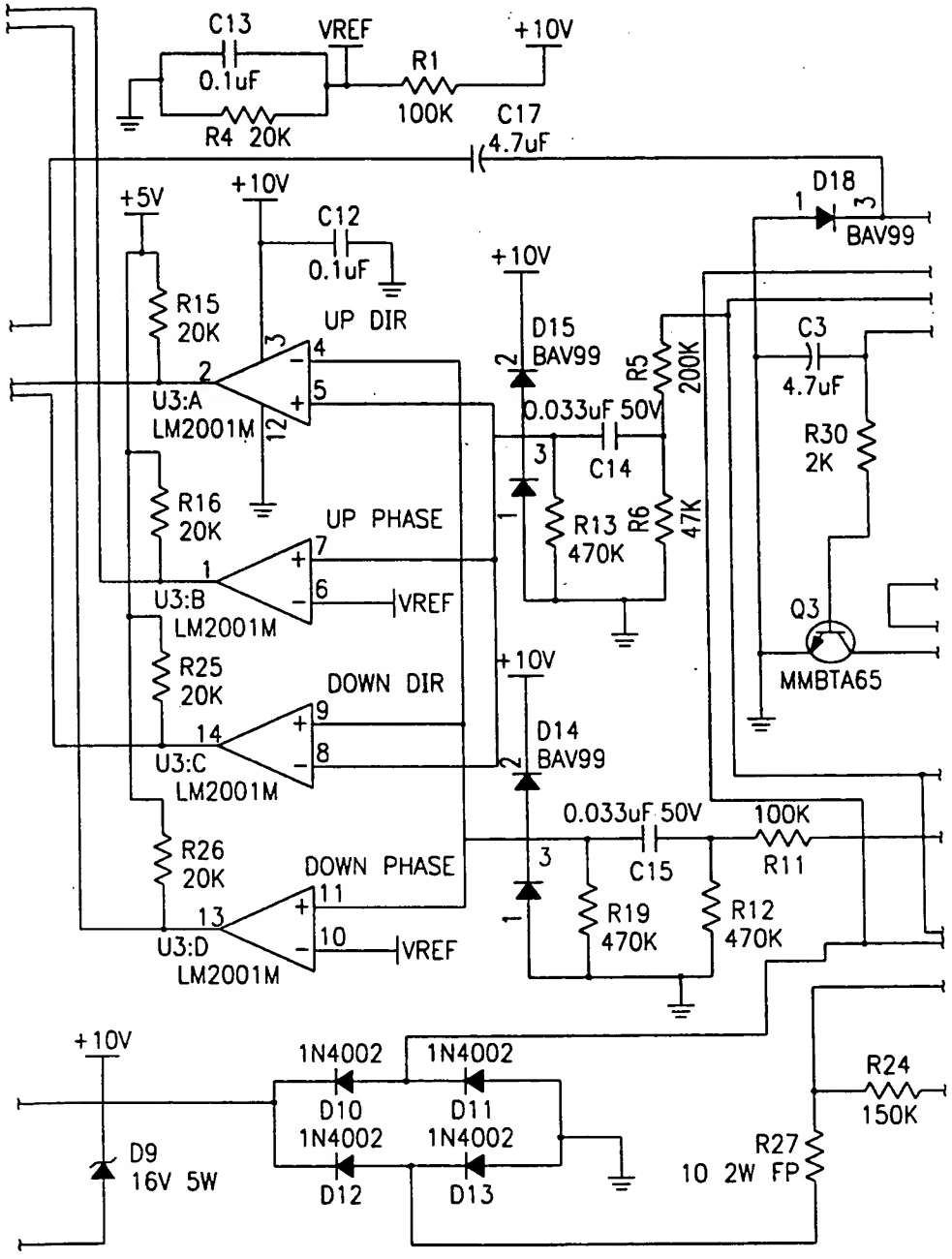

C13
0.1uF
R4 20K
VREF
R1
100K
+10V
C17
4.7uF
+5V
+10V
C12
0.1uF
R15
20K
UP DIR
U3:A
LM2001M
R16
20K
UP PHASE
U3:B
LM2001M
VREF
R25
20K
DOWN DIR
U3:C
LM2001M
R26
20K
DOWN PHASE
U3:D
LM2001M
VREF
D15
BAV99
0.033uF 50V
C14
R13
470K
R6
47K
R5
200K
D18
BAV99
C3
4.7uF
R30
2K
Q3
MMBTA65
D14
BAV99
0.033uF 50V
C15
R19
470K
R12
470K
100K
R11
+10V
D9
16V 5W
1N4002
D10
1N4002
D11
1N4002
D12
1N4002
D13
R24
150K
R27
10 2W FP

FIG. 11B

11 / 11

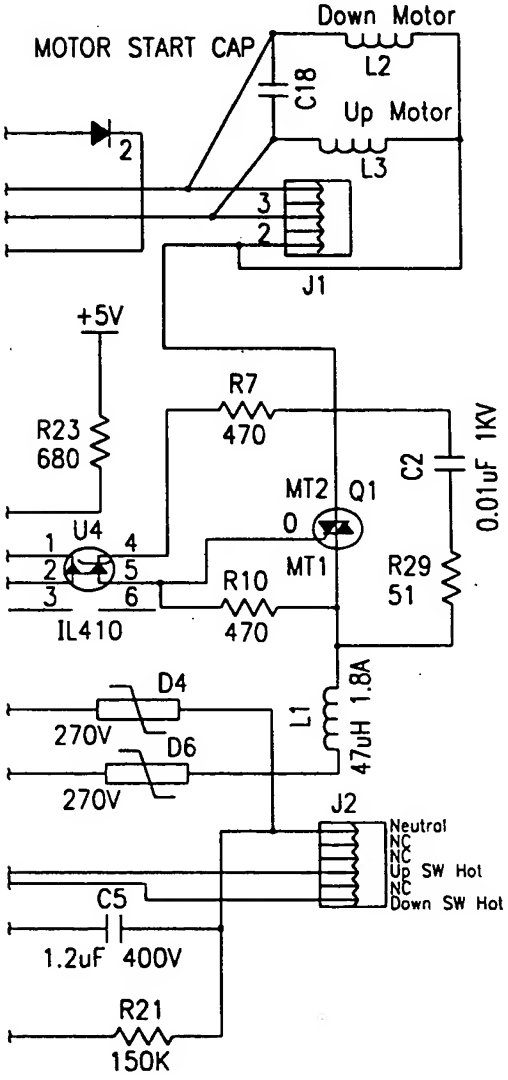

Down Motor
MOTOR START CAP
L2
C18
Up Motor
L3
2
3
2
J1
+5V
R7
470
R23
680
C2
0.01uF 1KV
MT2 Q1
0
U4
1
2
3
4
5
6
MT1
R10
470
R29
51
IL410
D4
270V
D6
270V
L1
47uH 1.8A
J2
Neutral
NC
NC
Up SW Hot
NC
Down SW Hot
C5
1.2uF 400V
R21
150K

FIG. 11C